Demand Response Database for Large Industrial, Agricultural, Water, and Commercial Customers

Project Overview

Problem Statement

For the PIER Program to meet the identified need for building an infrastructure for demand response programs, it is critical to understand all the elements of how end use customers select and respond to individual demand response programs. Encouraging end use customers to modify their use of electricity based on the demands placed on the electrical grid has the potential to moderate electricity price fluctuations and provide significant improvements in T&D system reliability/stability. Having a consistent, comprehensive, time-stamped database of end use customer participation in demand response programs is crucial for steering future PIER research and development efforts in Demand Response.

In the past, actual data collected during pilot and initial demand response programs was limited and difficult to use for research and analysis. During these previous programs, the data was collected by different sources and for different reasons. When the collected data from different sources was combined for analytical purposes, several problems became apparent: there were critical missing elements, there were gaps in the data, different levels of details had been collected, and it was difficult to relate data from different programs. These problems made it difficult to complete a sound analysis of the previous programs that would determining the appropriate levels of future research and development in demand response programs. The need for a single, consistent, comprehensive and reliable database with all the data properly time-stamped and catalogued was clearly identified. This effort addresses that need.

Relationship to PIER Goals

This Agreement meets the PIER Goal of "Improving the Reliability/Quantity of California's Electricity" by encouraging end use customers to participate in demand response programs and thereby reduce the overall demand on the electrical grid during times of peak demand or system constraints. The agreement also meets the secondary goal of "Improving the Energy Cost/Value of California's Electricity" by providing end use customers with new energy pricing options that permit them to meet their electrical needs and lower total costs.

Goals of this Project

The goal of this project is to prepare a comprehensive, consistent, time-marked and representative database related to participation in, and implementation of end use customer critical peak pricing, demand bidding, and other demand response programs for analysis by program evaluators.

Objectives of this Project

The objectives of this project are to:

- Define all the necessary data elements required to track end use customer performance in selected demand response program(s) during 2003 and 2004 as defined by WG#2 M&EC, WG#2 M&EC contractors, and other interested parties identified by the California Energy Commission Program Manager.

- Develop and deliver a data collection and storage capability based on an open and easily usable format.

- Collect, store, and catalog all defined data elements for a time frame specified by the California Energy Commission.

Project Theme

Create a unique, integrated, statewide demand response (DR) database containing all available relevant end use customer information with respect to selected demand response programs for industrial, agricultural, commercial, and other large end users in California. This database will provide researchers and policy makers at the California Energy Commission with access to historical demand response performance data and permit detailed research and overall assessments of selected California demand response programs and tariffs.

Data Access

Access to the DR Database is limited to CEC staff and authorized contractors who must abide by the end use customer energy data confidentiality conditions prescribed by the CEC with respect to the end user data in the database.

There are three access levels:

- Administrator – can modify database and data records
- Contractor – can modify data records
- Regular User – can view data records

Depending on the specific circumstances defined by the Energy Commission, these access levels can be restricted (e.g., to geographical areas).

DR Database Applications

The DR Database will enable in depth research and detailed analysis on various customer characteristics with respect to demand response program participation and performance, help design improved demand response programs, enhance sustainable program participation by customers, and improve customer performance on demand response event days.

DR Program Coverage for 2004

The initial draft of the DR Database will focus on the following DR programs:

- Critical Peak Pricing (CPP)
- Demand Bidding Program (DBP)
- Auto-DR Research Results
- Demand Reserves Partnership (DRP)

Database Structure

The principal framework of the database includes a three level data structure containing customer information. In this structure, each subsequent level is a subset of the preceding level. The three levels are:

- Account (Customer level that includes all facilities and/or buildings in CA)
- Facility (Campus or office/industrial park; includes all buildings in the facility)
- Building

This three level structure is augmented by three relational data structures that can be associated with any of the three levels in a unique or shared (multiple) fashion. These relational data structures include:

- Events – contains information about each event called for a DR Program selected by the user (generally shared among Accounts, Facilities, or Buildings)
- Contacts – contains information about each primary or secondary contact at an Account, Facility, or Building (may be unique or shared)
- Devices – contains information on specific devices that fall into one of seven categories (IP Network, EMS, Meter, Backup Generator, HVAC Controls, Lighting Controls, Gateway). The first four can be either unique or shared. The last three are unique. Gateways are attached to either meters or sensors (e.g., temperature). Some of these devices have time series data associated with them.

Data Characteristics

The database has the capability to store and independently track a wide range of characteristics including:

- Customer location information
- Customer building characteristics
- Customer equipment characteristics
- Energy characteristics
- DR Program participation status
- DR Program performance capabilities
- Customer communications and energy monitoring/management devices
- Time series data on a 15 minute interval (e.g., demand, temperature)
- Customer perspective surveys for Critical Peak Pricing (CPP), Demand Bidding Program (DBP), Demand Reserves Partnership (DRP)
- Auto-DR research data (from LBNL research)

Database Platform Host

Open Source software – Apache http server, PHP, MySQL

Project Contact Information

Energy Commission Contract Manager: Pramod Kulkarni
Phone: (916) 654-4637
Email: pkulkarn@energy.state.ca.us

Energy Commission Technical Consultant: Michael Gravely
Phone: (916) 834-3127
Email: mgravely@energy.state.ca.us

Program Contractor Contact: William M. Smith
Company: Infotility
Phone: (925) 275-3185 x206
Email: wmsmith@infotility.com